

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for mapping a user function for a programmable integrated circuit to a plurality of lookup tables, the method comprising:
providing a plurality of logic blocks, each configurable to operate as any one of the following:
one N-input lookup table, wherein N is an integer; and
at least two lookup tables, each having less than N inputs and an output;
based on an amount of variables input to the user function, determining a set of available lookup table configurations that potentially implement the user function, wherein a lookup table configuration specifies the number of the lookup tables and the number of inputs for each logic block;
decomposing the user function into a first set of decomposed functions, the user function receiving input variables;
determining whether the first set of decomposed functions can be implemented by one of a the set of lookup table configurations for the programmable integrated circuit; and
if none of the set of lookup table configurations can implement the first set of decomposed functions, rotating at least two of the input variables of the user function.

2. (Original) The method according to claim 1 further comprising:
decomposing the user function into a second set of decomposed functions; and
determining whether the second set of decomposed functions can be implemented by one of the set of lookup table configurations for the programmable integrated circuit.

3. (Original) The method according to claim 1 further comprising:
if the user function is not successfully decomposed into a set of decomposed functions, rotating at least two of the input variables of the user function; and

4 attempting to decompose the user function into a second set of decomposed
5 functions.

1 4. (Original) The method according to claim 1 further comprising:
2 if one of the lookup table configurations can implement the first set of
3 decomposed functions, placing lookup tables in the lookup table configuration into logic blocks
4 on the programmable integrated circuit; and
5 configuring programmable routing resources to connect the logic blocks on the
6 programmable integrated circuit.

1 5. (Original) The method according to claim 4 wherein one of the lookup
2 table configurations includes two 5-input lookup tables and one 6-input lookup table.

1 6. (Original) The method according to claim 4 wherein at least two of
2 the input variables are shared between two of the lookup tables.

1 7. (Original) The method according to claim 4 wherein one of the lookup
2 table configurations includes two 4-input lookup tables and one 6-input lookup table.

1 8. (Original) The method according to claim 1 wherein decomposing the
2 user function into the first set of decomposed functions further comprises decomposing the user
3 function into first stage functions and a second stage function,
4 outputs of the first stage functions being inputs into the second stage function.

1 9. (Original) The method according to claim 8 wherein rotating at least
2 two of the input variables of the user function further comprises swapping at least one of the
3 input variables of the first stage functions with at least one of the input variables of the second
4 stage function.

1 10. (Original) The method according to claim 9 further comprising:
2 attempting to decompose the user function into a second set of decomposed
3 functions based on the rotated input variables.

1 11. (Currently Amended) A computer program product stored on a computer
2 readable medium for mapping a user function for a programmable integrated circuit to lookup
3 tables, the computer program product comprising:

4 code for providing a plurality of logic blocks, each configurable to operate as any
5 one of the following:

6 one N-input lookup table, wherein N is an integer; and
7 at least two lookup tables, each having less than N inputs and an output;
8 code for determining a set of available lookup table configurations, based on an
9 amount of variables input to the user function, that potentially implement the user function,
10 wherein a lookup table configuration specifies the number of the lookup tables and the number
11 of inputs for each logic block;

12 code for decomposing the user function into a first set of decomposed functions,
13 wherein the user function receives input variables;

14 code for determining whether the first set of decomposed functions can be
15 performed by one of the set of lookup table configurations ~~a configuration of lookup tables~~ on
16 the programmable integrated circuit; and

17 code for rotating at least two of the input variables of the user function if none of
18 the configurations of lookup tables can implement the first set of decomposed functions.

1 12. (Original) The computer program product according to claim 11
2 further comprising:

3 code for rotating at least two of the input variables of the user function if the user
4 function is not successfully decomposed into a set of decomposed functions; and

5 code for attempting to decompose the user function into a second set of
6 decomposed functions.

1 13. (Original) The computer program product according to claim 11
2 wherein the code for decomposing the user function into the first set of decomposed functions
3 further comprises code for decomposing the user function into first stage functions and a second
4 stage function, outputs of the first stage functions being inputs into the second stage function.

1 14. (Original) The computer program product according to claim 13
2 wherein the code for decomposing further comprises:
3 code for decomposing the user function into a second set of decomposed
4 functions based on the rotated input variables, the second set of decomposed functions including
5 first stage functions and a second stage function,
6 wherein at least two input variables of the first and the second stages of the
7 second set of decomposed functions have been rotated with respect to input variables of the first
8 and the second stages of the first set of decomposed functions.

1 15. (Currently Amended) The computer program product according to claim
2 11 wherein the code for decomposing the first user function into the first set of decomposed
3 functions ~~second functions further~~ comprises code for decomposing the first user function into
4 the first set of decomposed functions ~~second functions~~ using a non-disjoint decomposition
5 technique.

1 16. (Currently Amended) The computer program product according to claim
2 11 wherein the code for decomposing the first user function into the first set of decomposed
3 functions ~~second functions further~~ comprises code for decomposing the first user function into
4 the first set of decomposed functions ~~second functions~~ using a disjoint decomposition technique.

1 17. (Original) The computer program product according to claim 11
2 further comprising:
3 code for placing lookup tables in one of the lookup table configurations into logic
4 blocks on the programmable integrated circuit, if that lookup table configurations can implement
5 the decomposed functions; and
6 code for configuring programmable routing resources to connect the logic blocks
7 on the programmable integrated circuit.

1 18. (Original) The computer program product according to claim 11
2 wherein one of the lookup table configurations includes two 5-input lookup tables and one 6-
3 input lookup table.

1 19. (Original) The computer program product according to claim 11
2 wherein one of the lookup table configurations includes two 4-input lookup tables and one
3 6-input lookup table.

1 20. (Original) The computer program product according to claim 11
2 further comprising:
3 code for decomposing the user function into a second set of decomposed
4 functions based on the rotated input variables, if none of the configurations of lookup tables can
5 implement the first set of decomposed functions; and
6 code for determining whether the second set of decomposed functions can be
7 implemented by one of the configurations of lookup tables for the programmable integrated
8 circuit.

1 21. (New) A method for mapping a user function to a programmable
2 integrated circuit, the method comprising
3 providing a plurality of logic blocks, each configurable to operate as any one of
4 the following:
5 one N-input lookup table, wherein N is an integer; and
6 at least two lookup tables, each having less than N inputs and an output;
7 based on an amount of variables input to the user function, determining a plurality
8 of available lookup table configurations that potentially implement the user function, wherein a
9 lookup table configuration specifies the number of the lookup tables and the number of inputs for
10 each logic block;
11 allocating the input variables of the user function to the inputs of the logic blocks
12 of a first configuration; and
13 determining whether the user function can be decomposed into a set of
14 decomposed functions corresponding to the allocation of the input variables of the user function,
15 each decomposed function having N or less input variables.

1 22. (New) The method of claim 21, wherein the at least two lookup tables
2 share inputs.

1 23. (New) The method of claim 21, wherein a logic block configured to
2 operate as at least two lookup tables receives more inputs than when the logic block operates as
3 the one N-input lookup table.

1 24. (New) The method of claim 21, further comprising:
2 if the user function can not be decomposed into a set of decomposed functions
3 according to the allocation of the input variables of the user function, swapping input variables
4 between two of the lookup tables in the first configuration.

1 25. (New) The method of claim 24, further comprising:
2 continuing swapping at least two input variables of the user function between the
3 inputs of at least two of the lookup tables in the first configuration until either a set of
4 decomposed functions corresponding to a new permutation of the input variables of the user
5 function is determined or until all of the permutations have been exhausted.

1 26. (New) The method of claim 25, further comprising:
2 if a set of decomposed functions is not found for the first configuration, repeating
3 allocating, determining, and swapping for additional configurations of the logic blocks that
4 potentially implement the user function.